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Mr. M. Donovan continued the reading of his paper on the Universal Vitality of Matter, &c.

May 28th, 1849.

REV. HUMPHREY LLOYD, D. D., President, in the Chair.

Dr. A. Smith laid before the Academy a manuscript catalogue of the Tradesmens' Tokens current in Ireland in the seventeenth century, and made a few observations on their use, as illustrating family history and other matters of local interest.

He stated that his object at present was, that the list should be printed in the Proceedings, with the view of circulating it extensively, and thereby inviting the collectors of coins throughout the country to communicate to him notices of such tokens as have not come under his observation, so as to enable him, at some future time, to publish a historical and descriptive catalogue, accompanied with engravings of such of the coins as are peculiar for their devices, or calculated to assist the local historian in his inquiries. (See Appendix, No. IV.)

Professor Davy brought under the consideration of the Academy, a new and simple method he had discovered of detecting manganese in inorganic and organic bodies, as in rocks, minerals, ores, soils, and in vegetable and animal substances, and also of obtaining the salts of manganese in a pure state.

The method consists in mixing the substance to be examined with a little flowers of sulphur, and heating the mixture to a temperature at, or even lower than that of redness, when, if manganese be present, a protosulphate will be formed, the sulphur being acidified, partly at the expense of the oxide, and partly by the oxygen of the air. The sulphate of manganese may be readily dissolved in pure water, and will yield a white prussiate of manganese with a solution of prussiate of potash. These experiments may be made on a very minute scale, where the object is merely to ascertain the presence of manganese, as in ores of iron, soils, &c.; when a slip of platina foil, glass, or porcelain, &c., may be used. Where, however, it may be desirable to obtain the pure salts from the sulphate of manganese, larger quantities of the common oxide of manganese must, of course, be employed. The presence of iron in the common oxide will not interfere with the results, unless under extraordinary circumstances. By this method the author has discovered manganese in a large number of iron ores, as the clay iron ores from Arigna, Merthyr Tydvil, America; the Elba iron ores and specular ores from other localities; the magnetic iron ores from Arendahl, Norway; also in the chromates of iron from North America and the Shetland Islands, kindly furnished by Dr. Scouler. In several of these ores, manganese, it is believed, had not previously been detected.

The Professor has also detected manganese in a number of soils, as in those from the counties of Cork and Kilkenny, and from near Dungannon.

The use of the sulphate of manganese is gradually extending. Already it affords a beautiful brown colour in dyeing and calico printing, and more recently it has been used in medicine as an emetic; and by no known method can it be so readily obtained, in such a pure state, as by the use of manganese and sulphur.

The fine brown durable pigment of manganese, alike applicable, it is believed, to the commonest purposes and the highest works of art, may also be readily procured by the method recommended.

Professor Davy noticed an experiment he had made, which seems to prove the delicacy of the test. He mixed Saxon manganese, sulphur, and fine siliceous sand, in the proportions, by weight, of 1 of manganese, 100 of sulphur, 1000 of sand; and on exposing ten grains of the mixed substances to a red heat on a slip of platina, the mixture afforded, with pure water, a solution of sulphate of manganese, which was rendered turbid by prussiate of potash. The method is applicable to organic substances, both vegetable and animal; but the Professor's experiments on such bodies are still in progress.

The Rev. Charles Graves communicated a general theorem in the Calculus of Quaternions:

Let Q be a variable quaternion, of which $f(Q)$ is a homogeneous function of the n^{th} degree; and let

$$S.df(Q) = S.NdQ,$$

then we shall have

$$S.NQ = nSf(Q). \qquad (1)$$

And, more generally, if Q, Q', Q'', &c., be any number of variable quaternions, of which $f(Q, Q', Q'', \ldots .)$ is a homogeneous function of the n^{th} degree; and if

$$S.df(Q, Q', Q'', \ldots) = S.NdQ + S.N'dQ' + S.N''dQ'' + \&c.,$$

we shall have

$$S.NQ + S.N'Q' + S.N''Q'' + \ldots = nS.f(Q, Q', Q'', \ldots) \quad (2)$$

Let us first establish the theorem in a particular case, and it will afterwards be easy to show that the proof admits of extension to the most general one. Suppose, therefore, that

$$f(Q) = RQR'QR''$$

where R, R', R'' are any constant quaternions; then

$$S.df(Q) = S.RdQR'QR'' + S.RQR'dQR'';$$

or, in virtue of the rule which permits us to execute a cyclic permutation on factors under the *scalar* sign,